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PARADIGMATIC ENTRAPMENT

by

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A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

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ABSTRACT

With the onset of the 21st century, new threats have emerged throughout the world that seek non-traditional means to attack the United States. In an effort to characterize possible non-traditional threats, the *National Defense Strategy of the United States of America*, March 2005, recognized that one future challenge to the United States could be from an enemy who employs disruptive technologies that negate current U.S. advantages. To meet the nature of this threat, a concept defined as paradigmatic entrapment provides an avenue for thinking about the problems an organization faces when an enemy employs disruptive technologies as an architecture in war. While developing operational art, military leadership must understand the danger of the phenomenon of paradigmatic entrapment and develop strategies to effectively deal with it.

Using historical examples from World War I involving the French and German armies, the concept of paradigms and how they develop within an organization is explored. By examining the French army development leading up to the start of the war, a model is proposed that describes how a paradigm is developed and matures within an organization. Strategies for dealing with the phenomenon are developed for current military leadership by exploring the actions taken by German leadership near the end of the war that resulted in the German army overcoming its mature paradigm. By focusing on organizational processes, lessons learned from the historical examples are applicable to organizations faced with disruptive technologies both now and into the future.

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CHAPTER 1

INTRODUCTION

My company was to take a trench. They had told us it was seventy yards away; it was more like two hundred... What did we do? We went forward under the shrapnel, lost, decimated, the first hundred yards. All the officers down... 'Let's get out of here!' my men say. And, as fast as they can leave, they fall down groaning.

--Sgt Paul Cazin
Account from World War I,
War Books

In the incident above, Sgt Paul Cazin was a sergeant in the 29th Infantry of the French army in World War I. During a battle in 1915, his unit was ordered to attack into the Ailly Wood, Meuse, on the Western Front, and he captured the results in his personal observations.¹ Why was his unit ordered to attack into a hail of artillery fire? French leadership had developed the belief of the supremacy of the offensive above all else.² This was not an isolated incident in World War I. The French army had developed a paradigm that greatly influenced its understanding of how to fight and win modern wars. The paradigm, however, did not take into account the innovations in technologies and their application that had evolved since the last major conflict. As a result, many battles ended with disastrous consequences for the French army.

Throughout the history of warfare, warfighting organizations develop operational art that aids in the preparation for fighting the next war. In developing methods of how to fight, these organizations often proceed along an evolutionary path that reinforces a particular paradigm, essentially becoming more efficient at fighting the last war. When

¹ Jean Norton Cru, *War Books*, ed. Ernest Marchand and Stanley J. Pincetl, Jr. (San Diego: San Diego State University Press, 1976), 114-116.

² Hubert C. Johnson, *Breakthrough!: Tactics, Technology, and the Search for Victory on the Western Front in World War I* (Novato: Presidio Press, 1994), 59.

the next war finally becomes a reality, a military organization attempting to apply the rules from a mature paradigm often faces disaster. Leaders and members within the organization may become trapped in their current paradigm. The thesis of this paper is that to better develop operational art, military leadership must understand the danger of the phenomenon of paradigmatic entrapment and develop strategies to effectively deal with it.³

The intent of this study is to define the ideas of paradigms and explain how they occur within an organization. The paper will then explore how a paradigm develops at the operational level of warfare by analyzing the development of the French army through the years leading up to World War I and the accompanying emergent technologies. After defining how the French became entrapped by their paradigm, the paper will present how the German army of World War I broke through essentially the same paradigm late in the war that almost resulted in victory. The German army breakthrough while engaged by an enemy in war uncovers underlying, timeless ideas that provide a foundation for overcoming the phenomenon of paradigmatic entrapment.

Although an inference can be made that the phenomenon of paradigmatic entrapment occurs at any level of organizations, this study will focus solely on the operational level of warfare defined by Joint Publication 1-02 as:

The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or operational areas. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing

³ The author was originally introduced to the idea and terminology of “paradigmatic entrapment” by Dr. Vardell E. Nesmith, Professor, Joint Forces Staff College, during a seminar discussion at the Joint Advanced Warfighting School in August 2006.

events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events.⁴

At this level of warfare, a commander uses operational art to aid his operational design process. Operational art is “[t]he application of creative imagination by commanders and staffs—supported by their skill, knowledge, and experience—to design strategies, campaigns, and major operations and organize and employ military forces.”⁵ Although the definitions above originate from the current joint doctrine of the United States Department of Defense, these concepts occur in military operations throughout history. This study uses these definitions to provide a frame of reference for both World War I examples used to examine the phenomenon.

⁴ Department of Defense, *Joint Publication 1-02: Department of Defense Dictionary of Military and Associated Terms*, as amended through 5 January 2007 (Washington, D.C., 2001), 390. [website on-line]; available from Joint Electronic Library at <http://www.dtic.mil/doctrine/jel/doddict>.

⁵ *Ibid.*, 389.

CHAPTER 2

BACKGROUND AND THEORETICAL FRAMEWORK

...but I remembered that it must be “Upward, and yet not Northward”

--Edwin A. Abbott
Flatland

The purpose of this chapter is to first provide a background for the idea of paradigmatic entrapment and then develop a framework that aids in the analysis of a military organization affected by the phenomenon. Section I defines how this study models organizations. Next, Section II defines the idea of paradigms in the way they were originally conceived and then looks at how paradigm theory aided the development of business innovation theory. Section II concludes with a look at how paradigm theory manifested itself within the realm of the military organization by theorists on revolutions in military affairs. With a foundation established, Section III proposes a model to look at the phenomenon of paradigmatic entrapment for a military organization at the operational level of war.

This study recognizes that care must be taken in transferring ideas and practices from other fields to military organizations. The stakes involved for the military organization are high in that they are measured in life and death vice that of profit gain or loss for business organizations. Additionally, military organizations, unlike businesses, develop their craft and tools in peacetime, often for long periods of time, without real-world application in war. As Williamson Murray noted, “...military forces in peacetime must innovate and prepare for a war 1) that will occur at some indeterminate point in the future, 2) against an opponent who may not yet be identified, 3) in political conditions

which one cannot accurately predict, and 4) in an arena of brutality and violence which one cannot replicate.”¹ As a result, military organizations tend to organize as large bureaucracies that resist change.² The stakes involved and bureaucratic nature, coupled with the idea that in war, organizations function in an environment where large amounts of friction make the simplest things difficult,³ make the military organization different from civilian counterparts. However, even with these constraints, military organizations are, in the end, another form of organization. People are united by a common cause under leadership to achieve goals, much the same as a business organization. As long as the focus is on organizational processes, paradigmatic theory espoused in other fields translates to military organizations, and the effects of paradigms may be magnified to a greater extent in them.

Section I. Organizational Construct

This study uses several ideas from organizational theory as a foundation for modeling organizations. First, organizations are modeled as open systems “...that need careful management to satisfy and balance internal needs and to adapt to environmental circumstances.”⁴ Gareth Morgan wrote the following example to help visualize an organization this way:

Let’s think about organizations as if they were organisms. We find ourselves thinking about them as living systems, existing in a wider environment on which they depend for the satisfaction of various needs. And as we look around the

¹ Williamson Murray, “Innovation: Past and Future,” in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996), 301.

² Stephen P. Rosen, *Winning the Next War* (Ithaca: Cornell University Press, 1991), 2.

³ Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976; reprint, New York: Alfred A. Knopf, 1993), 138.

⁴ Gareth Morgan, *Images of Organization*, 2d ed. (Thousand Oaks: Sage Publications, 1997), 44.

organizational world we begin see that it is possible to identify different species of organization in different kinds of environments.⁵

From Morgan's description, organizations are distinct entities within a larger environment. They are able to adapt and change over time while maintaining their identity.

Organizations as open systems not only act in the environment, but also react to elements in the environment. The environment, according to Henry Mintzberg, Bruce Ahlstrand and Joseph Lampel is defined as, "...the set of forces outside the organization."⁶ The environment includes both tangible economic resources, such as money, land and machinery and also the intangible interactions of the organization with other actors, such as suppliers, consumers and competitors.⁷ Since organizations are complex, open systems, the interactions with other organizations and actors form a complex web of relationships. As described by Harry Yarger, this creates an environment whose nature is, "...an interactive, chaotic, complex system of systems."⁸

Models for organizations as open systems recognize that a boundary exists between the members within an organization and the environment that defines membership in an organization. It is at the boundary that transactions between members of the organization interact with elements in the greater environment.⁹ Internal to the organization, the leadership element is responsible for directing the organization in

⁵ Ibid., 33.

⁶ Henry Mintzberg, Bruce Ahlstrand, and Joseph Lampel, *Strategy Safari: A Guide Through the Wilds of Strategic Management* (New York: The Free Press, 1998), 286.

⁷ Ibid., 294-295.

⁸ Harry R. Yarger, *Strategic Theory for the 21st Century: The Little Book on Big Strategy* (Washington, D.C.: Strategic Studies Institute, 2006), 7-8. [website on-line]; available at <http://www.StrategicStudiesInstitute.army.mil>, ISBN 1-58487-233-0.

⁹ Daniel Katz and Robert L. Kahn. *The Social Psychology of Organizations*, 2d ed. (New York: John Wiley & Sons, 1966), 65-66.

response to both inputs from members within the organization and interaction of the organization with the environment.¹⁰

Although able to interact openly with the environment, the organization defined inside the boundary develops structures that relate its members to their work and to each other. Using a two dimensional view, organizations develop both horizontal and vertical structures. In describing both of these dimensions, Daniel Katz and Robert Kahn wrote:

Work flow can be thought of as a horizontal dimension of organizational structure that locates people according to their membership and function in the production, maintenance, boundary, or adaptive subsystems... We can think also in terms of a vertical dimension, which differentiates people according to the power, privilege, prestige, and rewards of their organizational positions.¹¹

The structure that develops creates human and social relationships that result in stability for its members and defines the appearance of the organization.¹²

Through normal functioning, members within the organization develop an organizational culture. Mintzberg, Ahlstrand and Lampel use the following description of organizational culture:

It becomes the “organization’s mind,” if you like, the shared beliefs that are reflected in traditions and habits as well as more tangible manifestations—stories, symbols, even buildings and products... In a sense, culture represents the life force of the organization, the soul of its physical body.¹³

The culture forms the basis for the identity of the organization that includes “the history of internal and external struggles, the types of people the organization attracts, its work processes and physical layout, the modes of communication and the exercise of authority

¹⁰ Ibid., 532-533.

¹¹ Ibid., 76.

¹² James L. Gibson, John M. Ivancevich, and James H. Donnelly, *Organizations*, 3d ed. (Dallas: Business Publications, 1979), 489.

¹³ Mintzberg, Ahlstrand, and Lampel, 265-266.

within the system.”¹⁴ When a culture becomes extremely rich and well developed, it can be described as an ideology that is “a strong set of beliefs, shared passionately by its members, that distinguishes this organization from all others.”¹⁵ A well-defined culture shapes how the organization reacts to its environment.¹⁶

Using these organizational concepts as a foundation, this study will now look at how the idea of paradigms was originally conceived and then look at how paradigms influence organizations. Ultimately, this study argues that paradigms become rooted in the organization and have great influence on normal organizational processes.

Section II. Background

What is a paradigm? The scientific philosopher Thomas Kuhn used the idea of paradigms to describe how patterns emerge and reinforce themselves in the field of science. In his book, *The Structure of Scientific Revolutions*, Kuhn noted that normal science is based on one or more past scientific achievements that are recounted in textbooks and provide a foundation for a particular research field’s further study.

Coherent traditions of scientific research form around these achievements becoming a paradigm for that field.¹⁷ The study of paradigms:

...is what mainly prepares the student for membership in the particular scientific community with which he will later practice. Because he there joins men who learned the bases of their field from the same concrete models, his subsequent practice will seldom evoke overt disagreements over fundamentals. Men whose research is based on shared paradigms are committed to the same rules and standards for scientific practice. That commitment and the apparent consensus it

¹⁴ Katz and Kahn, 50.

¹⁵ Mintzberg, Ahlstrand, and Lampel, 267.

¹⁶ Katz and Kahn, 389-390.

¹⁷ Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 3d ed. (Chicago: University of Chicago Press, 1996), 10.

produces are prerequisites for normal science, i.e., for the genesis and continuation of a particular research tradition.¹⁸

As it matures, the paradigm has characteristics of greater articulation and increased specificity. Scientists working under the auspices of a maturing paradigm try to fit all the observed phenomena in nature in the box that is created by the paradigm.¹⁹ The paradigm itself provides the focus for the research and experimentation of scientists in the particular scientific field. Older scientists pass the ideas from the field to subsequent generations which then have the propensity to reinforce the paradigm.²⁰ Scientists educated in a field with a mature paradigm will often be fiercely resistant to change because they have devoted their careers and thinking to greater understanding of phenomena defined through the lens of the paradigm.²¹

In a scientific field with an established and mature paradigm, anomalies often begin to appear. Initially, scientists in the field of study may dismiss or explain the anomalies by adding corollaries to current theories within the existing paradigm. However, anomalies often precede a crisis that brings into question the fundamental assumptions on which scientists originally formed the particular paradigm.²² A new paradigm emerges that:

...is a reconstruction of the field from new fundamentals, a reconstruction that changes the field's most elementary theoretical generalizations as well as many of its paradigm methods and applications...When the transition is complete, the profession will have changed its view of the field, its methods, and its goals.²³

¹⁸ Ibid., 11.

¹⁹ Ibid., 23-24.

²⁰ Ibid., 27-29.

²¹ Ibid., 65.

²² Ibid., 82.

²³ Ibid., 85.

Kuhn labels the move to a new paradigm as a scientific revolution.²⁴ Scientists that usually formulate these paradigmatic shifts are young or relatively new to the field because they have little commitment to the older paradigm or have not been fully indoctrinated into it.²⁵

As an example, Kuhn wrote of the shift from Ptolemaic to Copernican astronomy, a shift that fundamentally altered the field of astronomy.²⁶ Astronomers developed a model of the universe where the Earth was at the center and all other planets and stars revolved around it. Ptolemy, an astronomer in Egypt, recorded this view around 130 A.D and was accorded the honor of having this geocentric system named after him. Under the Ptolemaic system, astronomers had to develop complex mathematical models to describe the observed motions of the celestial bodies to articulate this geocentric paradigm. As history progressed, astronomers increasingly were unable to explain observed phenomena with the mathematics of the Ptolemaic system. By the sixteenth century, Nicolas Copernicus studied in a field with an increasing number of unexplained anomalies. As a result in 1543, Copernicus published a book that proposed a new system where the Sun was the center of the universe and the planets revolved around it. The heliocentric system fundamentally changed his field of astronomy, simplifying the mathematics for celestial movement and accounting for many of the anomalies.²⁷

At the root of Kuhn's paradigmatic theory is the idea that individuals form mental models that help them make sense of the world. Peter Senge wrote that mental models are "...deeply held internal images of how the world works, images that limit us to

²⁴ Ibid., 90.

²⁵ Ibid., 90.

²⁶ Ibid., 68-69.

²⁷ Isaac Asimov, *The Universe: From Flat Earth to Quasar*, Revised ed. (New York: Walker and Company, 1971), 14-15.

familiar ways of thinking and acting.”²⁸ These mental models determine how individuals perceive the world in which they operate, providing the simplified assumptions that an individual uses to make sense of complex processes. The problem associated with these mental models is that when they exist below one’s level of awareness, an individual often does not challenge the underlying assumptions which can lead to a gap between reality and the perceived reality as filtered through them.²⁹

Outside the field of science, the ideas presented above of the nature of scientific paradigms and the underlying mental models manifest themselves in a slightly different way. Clayton Christensen applied the processes associated with the formation of paradigms and crisis that necessitates a paradigm shift to business organizations. Christensen noted that as organizations developed promising technologies into products they took either one of two forms, sustaining technologies or disruptive technologies.

In the normal cycle of business, organizations most often developed sustaining technologies that improved current product performance. Organizations developed them along normal product developmental lines in the current business model. Although many of the sustaining technologies were, “...radically new and difficult...they were not disruptive.”³⁰ Occasionally, a new technology or innovation appeared that initially performed worse than sustaining technologies in the current product marketplace but had new features that a small number of customers valued. These technologies eventually matured and allowed a new market to emerge that eclipsed the sustaining technology market. Christensen defined technologies that had these characteristics as disruptive

²⁸ Peter M. Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (New York: Currency Doubleday, 1990; Currency Paperback, 1994), 174.

²⁹ Ibid., 176.

³⁰ Clayton M. Christensen, *The Innovator’s Dilemma* (New York: Harper Business, 2000; First Collins Business Essential, 2005), 26.

technologies.³¹ In developing his theory of innovation differentiating between sustaining and disruptive technologies, Christensen recognized that mature organizations developed processes that reinforced a current paradigm.

As an example, Christensen noted in the late 1980s, Seagate was the primary manufacturer of 5.25-inch disk drive architecture for a large customer base that included companies like IBM. In 1984, a small Scottish firm, Rodime, developed the 3.5-inch disk drive architecture. Although smaller in physical size, the 3.5-inch drive architecture could only provide 20 megabytes of storage as compared to 40-60 megabytes of storage for the larger disk drives. Seagate was not oblivious to the smaller disk drives, developing a prototype of the technology to show its existing customers as early as 1985. IBM and their other existing customers stated that they had little or no interest in the new device, prompting Seagate's executives to cancel the program.³² Christensen noted, "Their reasoning? The markets for 5.25-inch products were larger, and the sales generated by spending the engineering effort on new 5.25-inch products would create greater revenues for the company than would efforts targeted at new 3.5-inch products."³³ In the end, the 3.5-inch market eclipsed the 5.25-inch market and eventually led to the total demise of the larger disk drive market. Seagate re-entered the 3.5-inch disk drive market in 1988 but was never to break into the new notebook computer market for 3.5-inch drives; its product primarily went to existing customers.³⁴

³¹ Ibid., xxiv.

³² Ibid., 21-22.

³³ Ibid., 22.

³⁴ Ibid., 23.

In facing these disruptive technologies, leadership plays a key role in adapting the organization because normal business processes has to shift.³⁵ Christensen stated:

Working harder, being smarter, investing more aggressively, and listening more astutely to customers are all solutions to the problems posted by new sustaining technologies. But these paradigms of sound management are useless--even counterproductive, in many instances--when dealing with disruptive technology.³⁶

Leadership faces a challenging prospect when it attempts to adapt the organization because, as Senge noted, "...insight into new markets or outmoded organizational practices fail to get put into practice because they conflict with powerful, tacit mental models."³⁷ Leadership has to develop strategies and plans, "...for learning and discovery rather than plans for execution."³⁸ Christensen's strategy for learning and discovery was a realization that leadership must identify the organizations' underlying assumptions that reinforced the current paradigm. Because of the bureaucratic inertia found in larger organizations, it is often younger organizations that are able to capitalize on emerging markets which became the future dominant paradigm in their particular field.³⁹

In the realm of the military organization, military thinkers recognize that paradigmatic theory manifested itself in the form of a revolution in military affairs, which, according to Richard Hundley, "...involves a paradigm shift in the nature and conduct of military operations which either renders obsolete or irrelevant one or more core competencies of a dominant player, or creates one or more new core competencies, in a new dimension of warfare, or both."⁴⁰ Hundley wrote that successful technology-driven revolutions in military affairs usually involved three components: the technology,

³⁵ Ibid., 139.

³⁶ Ibid., 83.

³⁷ Senge, 8.

³⁸ Christensen, *The Innovator's Dilemma*, 165.

³⁹ Ibid., 112-114.

⁴⁰ Richard O. Hundley, *Past Revolutions, Future Transformations: What can the history of revolutions in military affairs tell us about transforming the U.S. military?* (Santa Monica: RAND, 1999), 9.

the doctrine, and the organization. Using the development of blitzkrieg as an example, Hundley noted that the German revolution in military affairs resulted from "...the combination of the tank, two-way radio, and dive bomber technologies, an operational concept in which highly mobile armored forces broke through enemy lines and rapidly penetrated to the rear, and a force structure (the panzer division) that concentrated the available tanks into a few specialized divisions."⁴¹ In recognizing these three components, Hundley stated that it is the application of technology by an organization, not the technology itself, which brings about a revolution.⁴²

In further development of revolution in military affairs theory, Terry Pierce used Christensen's disruptive technology ideas at a system level to define disruptive architectural innovations. Pierce described the previous example of the development of blitzkrieg as a disruptive architectural innovation where "...existing core technologies (such as tanks, aircraft, and radios) [are combined] in a novel way—a doctrine shift."⁴³

In his study, Pierce concluded:

Most disruptive innovations occur when existing components are combined in novel ways. Rarely does a single technological breakthrough create a new way of warfare. For the most part, all necessary components of a new way of fighting exist, but only the true visionary sees how they can be combined differently.⁴⁴

In synthesizing Christensen's ideas with revolution in military affairs theory, Pierce defined a new concept that this study defines as a disruptive architecture.

⁴¹ Ibid., 15.

⁴² Ibid., 15.

⁴³ Terry C. Pierce, *Warfighting and Disruptive Technologies* (New York: Frank Cass, 2004), 16-17.

⁴⁴ Ibid., 200.

Hundley recognized a final, important characteristic of revolutions in military affairs in that, “The military utility...is frequently in doubt up until the moment it is proven in battle.”⁴⁵ Of his blitzkrieg example, Hundley wrote:

Not only most French and British generals but many German generals, including some in the German high command, doubted the value of the blitzkrieg up until the moment Guderian broke through at Sedan on May 13—14, 1940, and were vehement in expressing their doubts. Some French, British, and German generals continued to doubt it for days thereafter, even after Guderian reached the English Channel on May 20.⁴⁶

The importance of consideration of the enemy in actual combat is recognition that the environment plays a large role in what constituted a revolution in military affairs. An organizational model for dealing with the phenomenon of paradigmatic entrapment must consider the importance of the influence of the environment.

Section III. Paradigmatic Entrapment Model at the Operational Level of War

Using the ideas from Sections I and II, a proposed model is developed for how a paradigm develops in a military organization in the context of the operational level of war which may result in entrapment. In peacetime, the military organization develops a paradigm that becomes rooted in the organizational culture. Military leadership, embodied at the senior level by a general and the general staff, reacts to internal organizational innovations and interactions with the environment by developing concepts of operations for the organization in peacetime. Leadership filters these concepts through their mental models that aid in understanding of the situation. Upon receiving the concepts from leadership, the organization develops doctrine that supports the particular

⁴⁵ Hundley, 17.

⁴⁶ Ibid., 17.

worldview and defines how it fights using existing technologies. The doctrine and technology form an architecture that the organization develops with greater specificity.⁴⁷

In reaction to available architectures, the organization will mature and evolve through normal organizational processes. Members within the organization develop tactics and education that detail how the architecture will be employed in combat in accordance with the concept of operations. At the same time, organizational structures develop or evolve to optimize how the organization functions using the defined architecture. In conjunction with the maturing organizational processes, organizational members develop their own mental models that aid them in their understanding of the current situation. Over time, these mental models influence the organization's norms and values that eventually define the organizational culture. As a result of these processes, the paradigm within the organization has great impact on what members believe and is pervasive because of its impact on development of organizational structures.

Changes in the nature of the environment or development of innovative technologies that lead to a disruptive architecture may lead the organization to adjust its paradigm. Senior leadership is the key to recognizing when the current paradigm within the organization no longer applies and must take action to affect the organizational culture and structure, forcing its adaptation to the new reality. However, the consequences for a military organization suffering from the effects of paradigmatic entrapment at the operational level of war are only fully realized in actual combat.

Paradigmatic entrapment occurs when an organization fails to adapt to a disruptive architecture. The reinforcing nature of the paradigm coupled with the friction that is present in real world military operations makes a military organization as a whole

⁴⁷ Pierce, 16.

extremely resistant to change. The innovative technology or technologies that make up the disruptive architecture may be available to the organization itself, to an actor or other organization in the environment, or both. These technologies must be mature enough to allow them to be fielded by a military organization in battle in order to create a disruptive architecture.

As an example of the phenomenon, paradigmatic entrapment may occur when an organization has access to the innovative technologies and fails to develop them into a disruptive architecture. Due to the reinforcing nature of a mature paradigm, members in the organization may use the technologies within the existing architecture, not realizing the full potential of the innovations. According to Pierce, an innovation may even be overlooked because it, "...is more likely to under-perform initially the established approach, but when fully exploited is more likely to provide a significant battlefield advantage."⁴⁸ The organization has developed its structures and culture that support the current paradigm and hinder its ability to change.

A second example of paradigmatic entrapment occurs when a military organization faces an enemy in the environment that employs innovative technologies in a disruptive architecture. If the enemy employs a disruptive architecture that conflicts with the paradigm developed in peacetime, the reinforcing nature of the paradigm may lead the organization to become entrapped. Entrapment occurs when leadership does not recognize the disruptive change and take the actions necessary in the face of the enemy to adapt the organization to the new reality. Chapter 3 explores the ideas presented in this paradigmatic entrapment model through an examination of the development of the French army leading up to World War I.

⁴⁸ Ibid., 28.

CHAPTER 3

PARADIGMATIC ENTRAPMENT: FRENCH ARMY, WORLD WAR I

As we shall show, the defense is a stronger form of fighting than attack...I am convinced that the superiority of the defensive (if rightly understood) is very great, far greater than it appears at first sight.

--Carl von Clausewitz
Book I, Chapter 1.17
On War

The French army organization of World War I provides a good case to examine the phenomenon of paradigmatic entrapment. This chapter begins by looking at the development of the French army organization, both the organization itself and then the leadership in the organization, until the eve of World War I. Upon establishing the characteristics of the paradigm that formed in the French army, the disruptive architecture that was present at the start of the war is examined. The chapter will conclude with a few short vignettes that show reactions of the leadership to the disastrous events during World War I which illustrate the powerful reinforcing nature of paradigmatic entrapment.

Section I. The French Army Organization

The paradigmatic entrapment model proposed in Chapter 2 postulated that a paradigm becomes rooted in the organizational culture, affects the organizational structure, and is influenced by the architectures available to the organization. By examining the French army's development in these three areas from the time of its defeat by the Prussians in 1871 until the start of World War I in autumn 1914, this study lays the

groundwork for an understanding as to why the organization reacted as it did to the events during the war.

Prior to the beginning of World War I in 1914, the French army was a mature organization that had not fought in a major war since its defeat by the Prussians in 1871. This defeat had great influence on the minds of French soldiers and influenced much of the thought in the French army. In the Franco-Prussian War, Germany was unified as a nation and defeated France in less than a year. German troops, under Count Otto von Bismarck, marched into Paris in the winter of 1871, forcing the capitulation of the nation humiliating the people of France.¹ The introduction of *The Handbook of the French Army of 1914*, an official document read by French soldiers, provided insight of the foundation of organizational thinking:

In order to understand the military organization of France and to appreciate rightly the reasons for the sacrifices so willingly made by the nation for the Army and Navy at the present time, it is necessary to remember not only the disasters of the 1870 war, but also the cause of those disasters.²

In writing his memoirs, Marshal Ferdinand Foch noted, “In 1870, our High Command perished through its attachment to the defensive, and a passive defense at that.”³ This defeat provided a historical framework for members of the organization that led them to focus their thinking in terms of not repeating the mistakes of that war.

Structurally, the French army of 1914 numbered 610,000 strong with an authorization to recruit up to 750,000. The backbone of the structure of the military organization was its officer corps. Over 23,000 professional officers provided the

¹ Geoffrey Wawro, *The Franco-Prussian War: The German Conquest of France in 1870-1871* (Cambridge: Cambridge University Press, 2003), 295-296.

² *Handbook of the French Army 1914* (Nashville: The Battery Press, Inc., 1995), 7.

³ Ferdinand Foch, *The Memoirs of Marshal Foch*, trans. Col. T. Bentley Mott (Garden City: Doubleday, Doran and Company, Inc., 1931), viii.

leadership in the army, and they were spread mostly among the combat arms of the infantry, cavalry and artillery and the associated staffs charged with running the organization.⁴ The officers for the French army came from two sources, either graduating from a French military academy, Saint-Cyr or the École polytechnique, or by NCOs receiving a commission as officers.⁵ As the officers were promoted through the ranks, they had an opportunity to further their education by competitively applying for staff college after five years of commissioned service. The course of instruction at staff college lasted two years and upon successful graduation, students received the title of breveté denoting their accomplishment. Breveté officers would then normally be sent to staff for a two year assignment. Once so designated, captains and majors tended to spend a large portion of their future career in various staff billets.⁶ As noted by Dallas Irvine, these officers often had a sense of entitlement that caused consternation from others because many "...assumed that they were destined by their title of breveté to become generals."⁷

While at school, the officers learned various ideas on employment of the army that aided in the development of their mental models. Marshall Foch, then a Lieutenant Colonel, taught at the French staff college in the early 1900s, and the lectures from his tenure at the college were later published in book form. These lectures provide a glimpse of what was the basis of the thinking in the officer corps of the French army on the eve of World War I.

⁴ France, Ministère de la guerre, *Handbook of the French Army 1914*, 114-115.

⁵ Douglas Porch, *The March to the Marne: The French Army, 1871-1914* (London: Cambridge University Press, 1981), 78.

⁶ *Handbook of the French Army 1914*, 161-165.

⁷ Dallas D. Irvine, "The French Discovery of Clausewitz and Napoleon," *The Journal of the American Military Institute*, vol. 4, no. 3 (Autumn 1940), 152. [database on-line]; available from JSTOR, <http://www.jstor.org>.

Foch propagated two key ideas for the military in his writings. First, in understanding the importance of the offensive, Foch wrote that the goal of military operations is to seek out and fix the enemy and then defeat him in a decisive attack. Foch wrote that the “...decisive attack is the supreme argument used by modern battle.”⁸ Acknowledging that weapons of modern warfare had increased in both range and lethality, Foch thought that with proper battlefield preparation, primarily by artillery, the decisive attack would succeed.⁹ In the decisive attack of modern battle, Foch noted that fire favored offensive action and was “...never more...than a means of keeping the advance going.”¹⁰ With proper preparation, Foch wrote, “The laurels of victory are at the point of enemy bayonets. They must be plucked there; they must be carried by a fight hand to hand, if one really means to conquer.”¹¹ Even in the face of the extreme fire of modern weaponry, he believed the attack will lead to victory.

Coupled with his view on the importance of the offensive and the decisive attack, Foch’s second idea reinforced the idea for the importance of moral forces. In his Napoleonic example, Foch used a successful attack by General Jacques Macdonald at the Battle of Wagram in 1809 as an illustration. In this attack, a column of 22,500 men was reduced to 1,500 by the enemy’s gunfire, but they ultimately achieved victory. Foch noted, “This result was secured not by physical means--these were all to the advantage of the vanquished--it was achieved by purely moral action, which alone brought about decision and a complete decision.”¹²

⁸ Marshal Foch, *The Principles of War*, trans. Hilaire Belloc (London: Chapman & Hall, Ltd., 1918), 295.

⁹ *Ibid.*, 327.

¹⁰ *Ibid.*, 338.

¹¹ *Ibid.*, 341.

¹² *Ibid.*, 295-296.

The importance of moral action would have resonated with the French officers in school, reinforcing the ideas of the French military theorist Ardant du Picq who was becoming popular in France.¹³ In the book *Battle Studies*, du Picq started his general discussion on modern battle with:

The art of war is subjected to many modifications by industrial and scientific progress. But one thing does not change, the heart of man. In the last analysis, success in battle is a matter of morale. In all matters which pertain to an army, organization, discipline and tactics, the human heart in the supreme moment of battle is the basic factor. It is rarely taken into account; and often strange errors are the result. Witness the carbine, an accurate and long range weapon, which was never given the service expected of it, because it was used mechanically without considering the human heart. We must consider it!¹⁴

In this passage, du Picq made the human heart the key to triumph in battle regardless of the technology present. With Foch teaching at the French staff college and the ideas of du Picq gaining popularity, French officers developed a mental model that favored both the offensive and the supremacy of the human spirit in the face of battle.

Another factor that greatly impacted the French professional officer corps' culture on the eve of World War I was that it had suffered through a difficult developmental period from 1900 through 1911. An organizational culture of an officer corps more adept at administration instead of warfighting was the result. Following the Dreyfuss affair scandal, a left-leaning, ad hoc political group, known as the Radicals, came to power in the French government. One of the goals of the Radicals was to reform the French Army.

¹³ Michael Howard, "Men Against Fire: The Doctrine of the Offensive in 1914," in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton: Princeton University Press, 1986), 515.

¹⁴ Ardant du Picq, *Battle Studies*, trans. Colonel John Greely and Major Robert Cotton (Harrisburg: Stackpole books, 1946), 109.

Appointed to lead the army in 1900, General Louis André was the agent that the Radicals chose to implement their reforms.¹⁵ As noted by Douglas Porch, General André essentially wanted to “...republicanize the officer corps by bringing its political ideas, life style and social recruitment into line with the new requirements of the Radical republic.”¹⁶ In order to accomplish this goal, André began reforms that favored officer commissions from the ranks instead of officers commissioned by the military academies. From 1904-1909, his reforms led to fifty-nine percent of officers being commissioned from NCOs, which was opposite that of the time prior to the Radicals coming to power.¹⁷ This led to reducing the stability and professionalism of the NCOs in the army because “...the best sergeants were creamed off, leaving young inexperienced conscript NCOs and professionals who lacked the qualities to become officers.”¹⁸

The Radicals, through General André, also targeted the curriculum at the French Army’s military schools. As quoted by Porch, the future Radical war minister Maurice Berteaux stated:

The least that we can ask today from our officer corps is absolute loyalty to the republican government. To arrive at this result it seems to us that we must not neglect the assistance provided by military school teaching. In this teaching, a large place must be consecrated to civic and moral education.¹⁹

Military schools, as a result, began focusing more of their curriculum on economic and social problems instead of military tactics. These attempted reforms of the officer corps by the Radicals lowered the quality of officer training.²⁰

¹⁵ Porch, 73-76.

¹⁶ Ibid., 76.

¹⁷ Ibid., 79.

¹⁸ Ibid., 196.

¹⁹ Ibid., 78.

²⁰ Ibid., 82.

Another reform by the Radicals concerned how the officer corps was promoted. André wanted information on which officers in the army held republican sympathies in order to single them out for promotion. To gain this knowledge, he started keeping files on the political and religious beliefs of the officers in the army gained from their memberships in private organizations. André kept this highly personal information at the French Ministry of War and used it as an aid for selecting officers for promotion. When information concerning the files was leaked to the officer corps, officer discontent led to "...agitation, duels and court actions."²¹ The greater and more institutional effect of keeping these files, however, was that officers began to see promotions as "...an arbitrary affair in which men with the best connections stood to gain the most."²² Officers began to focus more of their time on currying favor with the well connected and insuring that their promotion reports read well. As Porch wrote, "The officer no longer spent time with his men but in administrative chores...the army is no more than a vast bureau where soldiers are worked while the officers spend their time writing."²³

Architecturally, the teachings of the offensive and the importance of attack had a large impact on the tactics that officers employed to accomplish their warfighting mission. Joseph Arnold noted that French army doctrine "...had vacillated between mass and dispersion"²⁴ from the end of the 1870 war until the 1900s. However, as the ideas of Foch and du Picq became the prevailing view in the French army, French officers began

²¹ Ibid., 92-94

²² Ibid., 98.

²³ Ibid., 131.

²⁴ Joseph C. Arnold, "French Tactical Doctrine 1870-1914," *Military Affairs*, vol. 42, no. 2 (April 1978): 61. [database on-line]; available from JSTOR at <http://www.jstor.org>.

to favor massed infantry over dispersion. The officers that favored the school of the offensive were known as the “Young Turks.”²⁵ Arnold wrote that these officers:

...believed in mass, the offense, and the ability of motivated troops to penetrate the extended fronts of modern battlefields. They assailed the popular emphasis on saving lives through dispersion...By calling attention to the problems inherent in dispersion and by emphasizing the offensive as the proper method to avenge France’s humiliation by Germany in 1870, the “Young Turks” combined tactical doctrine with emotional rhetoric to gain widespread popularity.²⁶

As the popularity and influence of the “Young Turks” ideas grew, French manuals for employment of the army also began to incorporate the lessons of the offensive. The French manuals developed a coherent strategy for the attack that involved the artillery primarily supporting the infantry advance. Soldiers would use artillery to force the enemy to reveal his positions, and then the mass of assembled infantry would advance following the initial barrage. When the infantry achieved a breakthrough in the enemy’s lines, the entire army, including the reserves would exploit the breakthrough in a final all-out massed attack.²⁷ Although the manuals recognized that massed troops advancing in the open presented an easy target for the enemy’s machine guns and rifles, the proposed solution to the problem was that the artillery barrage would force the enemy to take cover. The officers writing the manuals “...agreed that perseverance, determination, and the willingness to take losses was needed if any attack were to succeed”²⁸ echoing the importance of “human heart” in winning the attack.

As a result of their policies from their rise to power in 1900 until 1911, the Radicals greatly influenced the developing organizational structures, culture and architectures of the French army. The final piece to understanding the paradigm within

²⁵ Ibid., 63.

²⁶ Ibid., 63.

²⁷ Johnson, 15.

²⁸ Ibid., 17.

the French army organization on the eve of World War I is to focus on the senior leadership that was charged with employing the army. Section II will examine the French senior leadership and their actions through the eve of World War I.

Section II. The French Army Senior Leadership

As postulated in the paradigmatic entrapment model in Chapter 2, senior leadership reacts to organizational innovations and their understanding of the environment by developing concepts of operations for the organization in peacetime. These concepts are rooted in their mental models that aid in their understanding of the situation. This examination of the French senior leadership on the eve of World War I begins in 1911.

In 1911, as international relations between France and Germany began to rapidly deteriorate, the Radicals lost power to the French Nationalists. The French Nationalists, recognizing that they had inherited an army that had suffered greatly under the Radicals, sought to "...rehabilitate a war machine that had grown rusty from over a decade of neglect and restore the army as the focal point of French patriotism and national pride."²⁹

In order to accomplish this, they initiated several reforms for the French army, starting with its leadership. Undertaken first by the war minister Adolphe Messimy in the summer of 1911 and then continued by his replacement Alexandre Millerand in January 1912, reforms in the French army led to centralizing the military leadership in the position of chief of the general staff. Messimy appointed Marshal Joseph Joffre to the position.³⁰ In his memoirs, Marshal Joffre wrote of his extensive powers:

²⁹ Porch, 169.

³⁰ Ibid., 171-172.

In this way all of the powers of the military establishment finally became concentrated in my hands. It was the first time that any such authority had been confided to a single man. My action embraced the training of the Army, its doctrine, its regulations, its mobilization, its concentration... We had at last arrived at the logical conception that the man who would have the responsibility of commanding the Army in time of war, should, in time of peace, have in his own hands all the organs of preparation.³¹

Having the power of the French army consolidated in one person provides an ability to analyze this final piece of the paradigm model by studying Marshal Joffre's actions and thinking. By looking at Marshal Joffre's lessons learned from previous conflicts, his assessment of the French army and the doctrine and plans he established, this section will complete the description of the paradigm within the French army.

The mental models that influenced Marshal Joffre's perception of the situation provide an insight into his decisions and help to understand his actions after taking command. Like the military organization itself, Joffre was greatly affected by the results in the Franco-Prussian War. Joffre wrote that the lessons of 1870, "...amply proved that a passive defense is the forerunner of defeat."³² The prevalence of the images of the Franco-Prussian war throughout Joffre's memoirs suggest that the events of 1870 had great influence on Joffre's mental models and would impact his decisions.

Marshal Joffre's lessons learned from wars fought throughout the period prior to 1914 provide additional insight into his mental model for understanding current warfare. Joffre specifically wrote about two conflicts that could have forced changes to his mental model in light of the character of battle predicted by these wars. The Boer War between Great Britain and South Africa (1899-1902) and the Russo-Japanese War between Russia and Japan (1904-1905) each had elements which showed that a growing lethality of

³¹ Joseph Joffre, *The Personal Memoirs of Joffre, Field Marshal of the French Army*, vol. 1, trans. Colonel T. Bentley Mott (New York: Harper and Brothers, 1932), 24.

³² Joffre, *The Personal Memoirs of Joffre*, vol. 1, 26.

weapons made consideration of the defense an important aspect for any army. In the Boer War, Arnold noted, "...quick firing artillery, magazine rifles, and smokeless powder proved almost too much for the ill-prepared British army."³³ In the time following the war, the French proponents of dispersion "...were impressed with the British inability to carry out frontal assaults against the lightly-held Boer fronts."³⁴ Joffre, however, did not draw the same conclusions. He wrote:

...during the time immediately following the Anglo-Boer War...a whole series of false doctrines...began to undermine even such feeble offensive sentiment as had made its appearance in our war doctrine, to the detriment of the Army's spirit, its confidence in its chiefs and in its regulations. Basing his ideas upon the system successfully employed in the Transvaal by Lord Roberts when he was faced by the Boers...General de Negrier announced the impotence of any frontal assault and, declaring himself the enemy of so-called decisive attacks, he launched his famous theory as to the impregnability of an army's front.³⁵

Joffre rejected the conclusions of theorists who believed decisive attacks were impossible in light of the massive firepower of modern weaponry. Reinforcing his mental model that believed in the supremacy of the offensive, he favored the arguments of General Hippolyte Langlois. Langlois declared that "...the events of the South African War had been studied in a false light...fronts were not invulnerable, provided that on some given point superior fire action could be brought against the adversary."³⁶

The lessons learned by Joffre from the Russo-Japanese war also reinforced his belief in the offensive. In the Russo-Japanese war, both forces had modern weaponry that included magazine rifles, quick-firing artillery, mobile heavy artillery and machine guns. Both sides entrenched and used cover of night to press the attack as a result. Casualties were still extremely high in the face of the newer weaponry, but with extreme

³³ Arnold, 63.

³⁴ Ibid., 63.

³⁵ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 27.

³⁶ Ibid., 28.

courage, opposing sides were able to attack.³⁷ B. H. Liddell Hart stated, "...the ominous shadow of the machine gun--'concentrated essence of infantry'--began to creep across the battlefield, bringing movement to a standstill."³⁸ However, the lessons learned from the war did not match the realities of the battlefield. John Keegan wrote of the lessons learned by military theorists throughout Europe as:

The significance of improvised fortification--the entrenchments and earthworks thrown up at speed which defended by riflemen, had caused such loss to the attacker...had been noted but discounted. Given enough well-led and well-motivated infantry, the European military theorists believed, no line of trenches could be held against them.³⁹

Robert O'Connell noted that European militaries, "...selectively interpreted [dispatches from observers] in a manner which screened out the enormous power of field entrenchments, the deadliness of machine guns and quick firing artillery, and the futility and inevitably huge casualties accompanying frontal assault."⁴⁰ Joffre simply stated that, "The Russo-Japanese War brought a shining confirmation of these words [detailed in the previous paragraph] of General Langlois."⁴¹ Marshal Joffre found further affirmation that the mental models informing his paradigm were correct, disregarding the lessons that did not match his underlying assumptions.

In addition to learning from the lessons of real world operations, Joffre had an opportunity to learn about the changes of the character of modern warfare through a robust training and experimentation program. However, Joffre inherited an army whose skills had greatly atrophied during the Radical era. Porch wrote that French soldiers

³⁷ Howard, 517-518.

³⁸ B. H. Liddell Hart, *Through the Fog of War* (London: Faber and Faber, Ltd., 1938), 16.

³⁹ John Keegan, *The First World War* (New York: Alfred A. Knopf, 1999), 20.

⁴⁰ Robert L. O'Connell, *Of Arms and Men: A History of War, Weapons, and Aggression* (New York: Oxford University Press, 1989), 237.

⁴¹ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 28.

“...often had no alternative but to fill training hours with traditional drill. Training often took a back seat to the petty demands of garrison life.”⁴² This lack of training resulted in an army ill prepared to fight. During French army training maneuvers after his rise to power in 1912, Joffre noted that in the area of infantry tactics, “...the various actions were not coordinated; protection was badly carried out, imprudences in maneuver led to surprises, and there were grave errors in the use of artillery...[These exercises] proved how imperfect our instruments were.”⁴³ In the Grand Maneuvers of the following year, Joffre observed that, “...below the echelon of the army corps, our officers were not prepared to meet the conditions of modern war...”⁴⁴ highlighting the lack of officer expertise in the army. The end result of the current state of the army was that Joffre did not learn any new lessons that questioned his paradigm. He would now fully implement a concept of operations that embodied the spirit of the offensive for his entire army.

In implementing his concept of operations, Joffre recognized that one of his most important tasks was to provide a doctrine for the army. Joffre wrote, “The first question I had to solve was to know what general orientation should be given to the whole military organism for which I was now responsible. Above all it was imperative to endow the Army with a clear war doctrine, known to all and unanimously accepted.”⁴⁵ Joffre tasked his Chief of the Bureau of Operations of the General Staff, Lieutenant-Colonel de Loyzeau de Grandmaison to develop and write the doctrine.⁴⁶

Grandmaison developed the doctrine first in the form of two lectures he gave to the officers of the general staff in 1911. In the lectures, Grandmaison stated:

⁴² Porch, 201.

⁴³ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 33.

⁴⁴ Ibid., 33.

⁴⁵ Ibid., 26.

⁴⁶ Ibid., 29.

It is always necessary in combat to do what would be considered impossible when viewed in cold blood. For example: to advance under fire...The experience of all times shows that, in the offensive, security is obtained by being the first to provoke, in the adversary, that depression that will make him incapable of action. For this there is no other means except an immediate and total attack. To acknowledge the slightest reticence, even in detail, is to risk making the attack lose all its value...Our conclusion is that one must prepare oneself and prepare the others, by cultivating with passion, with exaggeration, and even in the smallest details of training, everything that bears--even in the smallest degree--the mark of the offensive spirit. We should go to the excess, and even this may not be enough.⁴⁷

In reading the passage, the previously presented ideas of both Foch and du Picq were echoed in an extreme form. For a French army that was hungry for ideas to guide their resurgence, Joffre noted that the "...two celebrated lectures' brilliance made them all the more dangerous."⁴⁸ The ideas from his lectures were then used as a basis for the French army's *Regulations for the Conduct of Major Formations* published in 1913.⁴⁹ The regulations stated:

The decisive battle, exploited fully, is the only means of breaking the will of the adversary, by destroying his armies. It constitutes the essential act of war...In order to win, it is necessary to break by force the enemy's combat formation. This breakthrough requires attacks that are pushed home without second thoughts. It cannot be obtained except by sacrifices of blood...The offensive alone leads to positive results.⁵⁰

Although decisive battle and the breaking of the armies is not an unrealistic goal for battle, the regulations do not put any constraints on the attack and encourage it in an

⁴⁷ Loyzeau de Grandmaison, *Deux Conférences faites aux officiers de l'état-major de l'armée (février 1911) : La notion de sûreté et L'engagement des grandes unités* (Paris: Berger-Levrault, 1912), 69; quoted in Gideon Y. Akavia, *Decisive Victory and Correct Doctrine : Cults in French Military Thought Before 1914, A Rereading of Ardant du Picq, Ferdinand Foch, and Loyzeau de Grandmaison* (Stanford: Center for International and Arms Control, 1993), 60.

⁴⁸ Ibid., 29.

⁴⁹ Howard, 520.

⁵⁰ France, Ministère de la guerre, *Decret du 28 octobre 1913 portant règlement sur la conduite des grandes unités : Service des armées en campagne* (Paris: Berger-Levrault, 1913), 6-7; quoted in Gideon Y. Akavia, *Decisive Victory and Correct Doctrine : Cults in French Military Thought Before 1914, A Rereading of Ardant du Picq, Ferdinand Foch, and Loyzeau de Grandmaison* (Stanford: Center for International and Arms Control, 1993), 56.

exaggerated form.⁵¹ Joffre noted that the regulation, "...was written in somewhat ardent prose, somewhat after the manner of a profession of faith...It affirmed, as a sort of dogma, that success in war could come only to him who sought to bring the opponent to battle and was capable of delivering it offensively with all his power..."⁵² Joffre finally had a doctrine for the army that matched his concept of operations. Porch noted that the army voraciously adopted the doctrine: "It was the very disorganization of the army which was responsible for [the offensive doctrine's] popularity. The high command, composed largely of timid old men, looked on helplessly as young, dynamic officers eager for a doctrine, any doctrine, took up the offensive."⁵³

With the doctrine in place, Joffre undertook the rewrite of the operational plan for a war with Germany--the final piece that completed the paradigm within the French army on the eve of World War I. This took the form of a revamp of the existing Plan XVI that became the infamous Plan XVII. Joffre wrote that from the outset France as well as other European powers thought the war would be short. In this context, Joffre noted that two ideas formed the basis for his decisions on writing the plan. First, he believed that every available man needed to be assembled for battle, and second that the French army had to seize the initiative.⁵⁴ With these two ideas forming the basis of his decisions coupled to the underlying assumptions of his mental model, Joffre developed Plan XVII to be a headlong attack across the common Franco-German frontier.⁵⁵ The orders generated from Plan XVII stated, "Whatever the circumstances, it is the Commander-in-Chief's

⁵¹ Gideon Y. Akavia, *Decisive Victory and Correct Doctrine: Cults in French Military Thought Before 1914, A Rereading of Ardant du Picq, Ferdinand Foch, and Loyzeau de Grandmaison* (Stanford: Center for International and Arms Control, 1993), 57.

⁵² Joffre, *The Personal Memoirs of Joffre*, vol. 1, 34.

⁵³ Porch, 231.

⁵⁴ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 66-68.

⁵⁵ Keegan, *The First World War*, 36-39.

intention to advance with all forces united to attack the German armies.”⁵⁶ Joffre’s concept of offensive operations was now codified in the operational plan of attack.

The paradigm within the organization was now complete. Marshal Joffre wrote his own assessment of the French army on the eve of World War I:

Therefore, when August, 1914, arrived, the situation was as follows: in the echelons of the High Command, many minds were still often paralyzed by habits of routine, and above all by the almost entire absence of strategic education. The staffs, as a rule, were well trained with good ideas and they had succeeded in freeing themselves from the exaggerations which had prevailed when the offensive began to be preached. From a tactical point of view officers had not yet come to understand fully all that the offensive entailed. While they saw in it a sort of dogma which they were quite willing through tradition and temperament to accept, they nevertheless had not yet comprehended all its exigencies... The men in the ranks were ardent, well trained, capable of any boldness and ready for any sacrifice. Indeed, here precisely lay the danger in view of the mediocre quality of the officers which I have just explained.⁵⁷

Leadership, under Joffre, had developed a concept of operations based in his mental model that favored the offensive. The French officer corps, in the years of development leading up to the war, also had developed the culture of the organization to favor the offensive which was embedded in army’s norms and values. These entrenched views in the culture coupled with those of senior leadership formed the paradigm for the army organization as a whole. However, the disastrous consequences of paradigmatic entrapment had not yet occurred because hostilities had not yet become a reality. In August 1914, however, Germany declared war on France. To understand why the French army organization was entrapped in its paradigm, Section III will examine the disruptive architecture that changed the character of war.

⁵⁶ *Les armées françaises*, tome I, Vol. I, 19; quoted in S. R. Williamson, “Joffre Reshapes French Strategy, 1911-1913,” in *The War Plans of the Great Powers, 1880-1914*, ed. Paul Kennedy (London: George Allen and Unwin, 1979), 147.

⁵⁷ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 35.

Section III. Disruptive Architecture

The proposed model in this study previously defined disruptive architectures of the military as employment of innovative technologies that fundamentally alter the character of warfare necessitating a shift in the operational concepts, doctrine, and tactics of the military involved. These technologies must be mature enough to allow them to be fielded by a military organization during battle. In August 1914, the combined effects of improvements in weaponry and improvements in logistics in support of the defense created a disruptive architecture. In the area of weaponry, the innovative technologies were improved machine guns and artillery. In the area of logistics, major improvements to the railway systems facilitated the innovative ability to move large numbers of soldiers rapidly in support of operations.

Although neither the machine gun nor artillery were new systems, evolutionary improvements to both led to a steep increase in the amount of firepower available to combatants. The machine gun improved most notably in 1884, when Hiram Maxim patented a one barrel gun that used its own recoil to fire itself. This gave the gun the ability to fire up to 2,000 rounds over a three minute period.⁵⁸ Artillery also improved its rate of fire. In 1897, based on the work of Captains Emile Rimaihlo and Sainte-Claire Deville, the French developed a hydraulic recoil system for their M1897 75mm field gun. According to Boyd Dastrup, with this development, "...a well-trained French gun crew could, in an emergency, fire up to thirty rounds of aimed fire a minute with fixed ammunition up to 8,000 yards. Within years the Germans, Russians, British, and

⁵⁸ J. F. C. Fuller, *The Conduct of War, 1789-1961: A Study of the Impact of the French, Industrial, and Russian Revolutions on War and its Conduct* (New Brunswick: Rutgers University Press, 1961), 135.

Americans were adopting field guns...comparable to the French M1897 75mm gun.”⁵⁹

When the combination of these two technologies was employed in support of defense on the battlefield, Martin Van Creveld noted the following effect:

Ultimately the net effect of the progress in weapons technology was to increase enormously the volume of fire that could be delivered, the range at which it could be delivered, and the accuracy with which this could be done. The combination of all three factors meant that, square meter by square meter, the battlefield became a more deadly place than ever before. Metal in the form of bullets from quick firing rifles and machine guns, as well as fragments from artillery shells, came hurtling through the air in quantities that would previously have appeared absolutely incredible. In the words of a book that acquired great fame after 1919, warfare entered a new medium and increasingly took place in a storm of steel.⁶⁰

The immense availability of firepower made frontal attacks costly in terms of casualties and rendered offensives of massed formations next to impossible. As a result, infantry would be driven to field fortifications in the form of trenches.⁶¹

In conjunction with the innovations in firepower, national railway infrastructure had also evolved since the mid-1800s. Throughout the period prior to the war, military leadership recognized the need to influence the development of railways due to their possible use during war in support of moving large formations of troops and supplies. As a result, nations built extensive railway systems. As Richard Preston and Sydney Wise noted, the extensive railway networks in Europe were “...built with an eye to strategy as well as commerce, [and] made it possible to rush huge armies to the frontier within a few hours of a general mobilization.”⁶² When used in support of defensive operations,

⁵⁹ Boyd L. Dastrup, *The Field Artillery: History and Sourcebook* (Westport: Greenwood Press, 1994), 40.

⁶⁰ Martin Van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: The Free Press, 1989; First Free Press Paperback, 1991), 171.

⁶¹ O’Connell, 265.

⁶² Richard A. Preston and Sydney F. Wise, *Men In Arms: A History of Warfare and Its Interrelationships with Western Society*, 2d ed. (New York: Praeger Publishers, 1970), 266.

leadership could quickly move large numbers of reinforcements throughout their theater of operations to prevent attackers from capitalizing on any initial successes.⁶³

These technological innovations formed the system, a disruptive architecture, which was available to all combatants at the onset of the war. Van Creveld recognized that it was a combination of the weaponry and logistical innovations that brought about the fundamental change in the conduct of warfare that:

...affected first the infrastructure of war and then, increasingly, its conduct as well. Each of the newly invented machines separately was much more powerful than its predecessors. Though that was important, above all it was the fact that they could only be produced and used in integrated systems which brought about the new situation.⁶⁴

This disruptive architecture in support of the defense caused all military participants that used frontal attacks in support of offensives to suffer greatly. Without adaptation to the new reality created by the disruptive architecture, the French army became entrapped in its paradigm. To identify some of the characteristics of paradigmatic entrapment, Section IV looks at a few examples from the French army experience in World War I.

Section IV. Results of Paradigmatic Entrapment

As noted in the proposed model in Chapter 2, if the enemy employs a disruptive architecture that conflicts with how the organization developed in peacetime, the reinforcing nature of a mature paradigm within the military organization may lead to entrapment in war. In the case of World War I, the disruptive architecture employed by the German army in support of defense fundamentally altered the anticipated character of war. Reactions of both French senior leadership and military members to events throughout World War I illustrate that without active involvement of senior leadership to

⁶³ Van Creveld, 169.

⁶⁴ Ibid., 166.

implement fundamental change, the military organization will be greatly influenced by its developed paradigm disregarding the evidence gained from actual experience. In the following examples, some of the characteristics of paradigmatic entrapment are explored.

The first characteristic of paradigmatic entrapment is that senior leadership is influenced by its mental models to draw conclusions from its current situation supporting the mature paradigm. In August of 1914, the German army executed General Helmuth von Moltke's version of the Schlieffen plan that called for a double envelopment of forces on the Western Front. The plan called for the right wing of the army to attack through Luxemburg, Belgium and west of Paris and then wheel eastward to crush the French armies fixed by the left wing of the army. In his version of the Schlieffen plan, Moltke worried about the possibility of attack on the left wing of the German army and intentionally strengthened it to forty-two per cent of his right wing.⁶⁵

In executing its Plan XVII offensive against the German army in the Alsace and Lorraine region of France, the French attacked into the strong defenses of the German left. Known to the French as the 'Battle of the Frontiers,' the battle lasted until August 25, 1914 when the French army was resolutely defeated across its entire attacking front. During the battle, 300,000 French soldiers were killed in the action of pressing the offensive. The defeat was so extreme that the German General Helmuth von Moltke believed that the German army had already won the decisive battle of the war.⁶⁶ Captain B. H. Liddell Hart records a picture of the French army during the battle as, "The troops attacked blindly with the bayonet and were mown down by machine-guns."⁶⁷ The army executed within its established paradigm and suffered enormous casualties.

⁶⁵ Fuller, 155-156.

⁶⁶ Ibid., 158.

⁶⁷ B. H. Liddell Hart, *The Real War, 1914-1918* (Boston: Little, Brown and Company, 1930), 58.

In response to the military disaster, Joffre's reactions show how his perception of the situation, filtered through his mental model, reinforced the current paradigm. After his initial surprise to the disastrous failure of the attack, Joffre settled on two factors as the primary cause of the August failure, neither of them dealing with the improved firepower on the battlefield. Joffre blamed his generals in the field and the army misapplying its tactics. In response, Joffre removed from field command any general that he believed was incompetent.⁶⁸ With new leadership in place, Joffre recorded his thoughts on the misapplication of tactics as:

...the principles of the offensive which we had tried to inculcate in the army before the war had often been poorly understood and badly applied. From all points of the front came reports of mistakes made in handling troops, mistakes which had brought about heavy losses and sometimes reduced to nought the offensive and defensive qualities of the men...Far and beyond all, the co-operation of the infantry and the artillery was constantly neglected.⁶⁹

Joffre took actions to ensure better coordination between infantry and artillery and that infantry advances in the future would be preceded by massive artillery barrages.⁷⁰

While both of problems of leadership and problems of tactics had validity, Joffre's plan for the next operation show how the paradigm within the organization continued to influence his thinking. Joffre wrote:

If the first maneuver as conceived had failed, there was nothing to do but prepare another. In spite of the painful necessity involved of abandoning a part of our territory, it was requisite to yield ground at first, in order to give the time and space needed for reconstituting a mass capable of resuming the offensive.⁷¹

Despite 300,000 soldiers killed in action, Joffre's response was to buy enough time to regroup and prepare for another offensive. His conclusion was that it was not the

⁶⁸ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 184.

⁶⁹ Ibid., 185.

⁷⁰ Howard, 524.

⁷¹ Joffre, *The Personal Memoirs of Joffre*, vol. 1, 182.

offensive in the face of a disruptive architecture that was flawed; it was other factors that caused the failure of the battle.

Throughout 1915, Joffre pushed his army for an offensive breakthrough. The French army repeatedly attacked along the Western Front, increasing the number of troops and the amount of munitions with each failure to break through the German lines.⁷² Preston and Wise wrote that the main variation of tactics:

...was to increase the amount of preliminary artillery barrage, to achieve suspense in its employment, to vary its use by such techniques as the creeping barrage behind which the infantry advanced, the box barrage which isolated a section of enemy trenches, and the saturation barrage in which the concentrated fire of all available arms was poured on a small area to obliterate it.⁷³

After a year and a half of attacks with mounting casualties, Joffre tasked the French army and its British allies to attack at the Somme in the summer of 1916. Continuing the theme of massive artillery bombardment prior to offensive action, French and British artillerists poured 1,738,000 shells into the German lines prior to the army's advance. Following the bombardment, both the French and British attacked on July 1st and were met again by the disruptive architecture employed by the Germans. Attacking throughout the rest of the summer and into the fall, the battle officially ended on November 14, 1916. The British suffered 419,654 casualties and the French suffered 194,451 casualties in an operation that resulted in conquering a strip of ground thirty miles long and a maximum depth of seven miles.⁷⁴

Joffre's reactions to the battle of the Somme further illustrate how his mental models influenced his future plan of action. After the end of the battle in November, Joffre wanted to continue the offensive until impeded by winter weather. Joffre wrote of

⁷² Hart, *Through the Fog of War*, 25.

⁷³ Preston and Wise, 266.

⁷⁴ Fuller, 168.

his request to the British army for them to press the offensive, “I knew that I was asking fresh sacrifices of an army which had already lost 250,000 men and 12,000 officers on the Somme; but I thought that these sacrifices might with justice be exacted of an army which now had in France a million and a half men.”⁷⁵ Even in the face of the staggering losses of the British army, Joffre still was entrapped by his paradigm. Joffre’s concept of the continued operations for the spring of 1917 was to, “...undertake the decisive battle which would be the completion of the one we had waged in 1916. I conceived this battle of the spring of 1917 under the following form: French offensive operations carried on between the Somme and the Oise with three armies.”⁷⁶ Writing in 1917, Captain Rimbault, a veteran French front line officer, best summed up the effect of paradigmatic entrapment on the senior leadership:

Never having been in the furnace, [senior leadership] let their understanding crystallize into old formulas...At the beginning of the war, we line officers were never asked our opinion; and when we were unfortunate enough to interpose an objection...we were lucky if we weren’t looked at askance...Hypnotised by their pre-war ideas, ideas of industrious school-boys, [senior leadership] couldn’t see the picture of the combatant, the shell that shatters, the machine gun that sweeps, and the barbed wire that bars the way. And therein consisted all the art of modern war.⁷⁷

In close contact with the realities of the current situation, younger members of the organization, such as Captain Rimbault, recognized how senior leadership failed to understand the new reality of warfare and instead continued to rely on ideas that were heavily influenced by the current paradigm.

In addition to its influence on senior leadership, a paradigm, once embedded in the organizational culture, has great influence on the perceptions of members in the

⁷⁵ Joseph Joffre, *The Personal Memoirs of Joffre, Field Marshal of the French Army*, vol. 2, trans. Colonel T. Bentley Mott (New York: Harper and Brothers, 1932), 482.

⁷⁶ *Ibid.*, 486.

⁷⁷ Cru, 79-80.

organization. In a description of the briefings given prior to the battle of the Somme, Keegan gives an example of how the perceptions of members of the French army were reinforced by the current paradigm for the offensive. They believed:

...the real work of destruction, both of the enemy's defenses and men, would have been done by the artillery before zero hour...the main task of the infantry would be merely to walk forward to the objectives...moderating their pace to that of the barrage moving ahead of them... [and] install themselves in the German reserve trenches to be in perfect safety...[The army] believed in the reassurances proffered by the staff who, to be fair, believed them also.⁷⁸

Within the organization, the paradigm had created a filtered view of the situation that did not match reality. With almost two years of fighting and opportunities to learn, officers throughout the French army still believed that the offensive supported by massed artillery would enable the infantry to walk up without resistance and take the trench.

A second example of the effect paradigmatic entrapment on the perception of organizational members is illustrated in a book published in 1918 written by General René Radiguet of the French army. With the purpose of educating the American army as to the nature of the current warfare, Radiguet wanted to provide the Americans with the lessons learned from the French army. Radiguet wrote, "One might be inclined to believe that, in the present war and since the victory on the Marne, the general rules of strategy and tactics have been modified. Not at all. The ways of fighting and the armament only have undergone transformation."⁷⁹ According to Radiguet, except for the move to trench warfare, strategy and tactics had not changed in three years of battle, indicative of the reinforcing nature of the formed paradigm. Radiguet stated that, "The manner in which

⁷⁸ John Keegan, *The Face of Battle* (New York: The Viking Press, 1976), 215.

⁷⁹ René Radiguet, *The Making of a Modern Army and Its Operations in the Field: A Study Based on the Experience of Three Years on the French Front (1914-1917)*, trans. Henry P. du Bellet (New York: G. P. Putnam's Sons, 1918), 10.

the different arms are employed on the battlefield has changed but little.”⁸⁰ Building a picture of these tactics, Radiguet described the following:

Our officers have always and from the first day of war invariably marched ahead of their men, leading them straight to the enemy. They have advanced through the most intense curtain fire; they have exposed themselves to the fire of innumerable machine-guns; they have been targets of rifles and grenades. Thousands have been killed; not one has hesitated, not one has turned back.⁸¹

In his writing, Radiguet illustrates the persistence of the offensive paradigm, painting a picture of officers leading men straight to the enemy, always on the attack, regardless of the firepower. With over three years of experience, the French army was still entrapped by its paradigm due to how deeply it was embedded in the organizational culture.

The French army of World War I illustrated an extreme case of the phenomenon of paradigmatic entrapment. In its development leading up to the war, the army demonstrated that once ideas become embedded within the organization, they affect how the organization operates internally and will respond to events in the environment. When the paradigm within the organization is in conflict with the reality of the situation, organizational members often will come to the wrong conclusions in support of their current world view. In the case of the French army, this led to the disastrous consequences of World War I and provided illustrations of some of the characteristics of a mature paradigm influencing members within an organization.

In Chapter 4, possible strategies that can be utilized to combat entrapment are examined. The Ludendorff reforms of the German army beginning in the fall of 1916 provide initial insight into breaking through a mature paradigm within an organization.

⁸⁰ Ibid., 13.

⁸¹ Ibid., 127.

CHAPTER 4

BREAKING THROUGH PARADIGMS: GERMAN ARMY, 1916-1918

What were ducks in the scientist's world before the revolution are rabbits afterwards. The man who first saw the exterior of the box from above later sees its interior from below.

--Thomas S. Kuhn
Chapter X
*The Structure of Scientific
Revolutions*

While no single magic formula exists for dealing with the phenomenon of paradigmatic entrapment, history has shown that various military leaders have successfully dealt with the problem. The German army organization under the leadership of Field Marshal Paul von Hindenburg, the First Chief of Staff of the Armies of the Field, and General Erich von Ludendorff, the First Quartermaster-General, successfully adapted itself twice to the disruptive architectures of World War I. By examining both periods of time through the lens of the paradigmatic entrapment model, common themes emerge showing how its leadership fostered conditions in the army for organizational innovation that almost led to a German victory in the war. Although the army organization was not specifically thinking in terms of paradigms, its actions shed light on possible concepts to cope with the phenomenon.

This study primarily focuses on General Ludendorff as the leader who made the decisions for the German army at this time. Hindenburg described his relationship to Ludendorff as, "...those of a happy marriage. In such a relationship how can a third party clearly distinguish the merits of the individuals? They are one in thought and action, and often what the one says is only the expression of the wishes and feelings of

the other.”¹ Although Hindenburg outranked Ludendorff, Ludendorff was essentially the operational commander primarily responsible for the actions of the German army.²

The first section of this chapter will begin with a short background on the events that led to General Ludendorff becoming the First Quartermaster-General of the army, the situation in which he found himself, and the results of his actions. In the second section, both periods of reform will be examined simultaneously to uncover possible strategies for breaking through a paradigm at the operational level of war.

Section I. Background and Results

From the onset of World War I until the autumn of 1916, the German army was successful in repelling the attacks of the Entente using the disruptive architecture detailed in Chapter 3 in support of its defensive operations. However, when it came to offensive operations, the German army suffered from a similar paradigm that plagued the French army, resulting in enormous casualties during massed attacks and leading to trench warfare. The Entente’s disruptive architecture was comprised of essentially the same elements as that of the German army. In 1916, the commanding general of the German army on the Western front was General Erich von Falkenhayn. Recognizing that war had become a war of the trenches, Falkenhayn elected to plan for an attack at Verdun with a goal of slow attrition to the Entente’s forces. However, as Michael Geyer remarked, the nature of the German army organization and tactics, “...were geared to all-out offensives,

¹ Paul von Hindenburg, *Out of My Life*, trans. F. A. Holt (New York: Harper and Brothers, 1921), 104.

² Timothy T. Lupfer, *The Dynamics of Doctrine: The Changes in German Tactical Doctrine During the First World War* (Fort Leavenworth: Combat Studies Institute, U. S. Army Command and General Staff College, 1981), 8.

and found it difficult to shift to a war of calculated and one-sided attrition.”³ This description of the German army highlights that its paradigm was similar to that of the French army, favoring the all-out offensive. Beginning the attack in February, the German army fought the Verdun battle throughout the summer. The battle resulted in a stalemate at a cost of 281,333 casualties to the German army. The failure of the plan drove the Kaiser to replace Falkenhayn with Field Marshal Hindenburg and General Ludendorff.⁴

Hindenburg and Ludendorff became the leadership for of the entire German army on August 28, 1916. As was the case with Marshall Joffre, they essentially controlled all aspects of both the German army and the operations of their allies. Hindenburg recounted that in the summer of 1916, Germany developed a single central authority known as the Supreme Command whose powers rested with the German Emperor. However, the German Emperor essentially delegated his authority for all military matters to Hindenburg. Hindenburg wrote, “The Chief of the General Staff of the Field Army received the right to issue orders ‘in the name of the Supreme Command’ and make arrangements with the commanders-in-chief of the allied armies.”⁵ While in this position, Hindenburg relied on his second in command, Ludendorff, to chart the course for all of the operations of the army.

Hindenburg described the current situation that Ludendorff and he faced on the Western Front as:

³ Michael Geyer, “German Strategy in the Age of Machine Warfare, 1914-1945,” in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton: Princeton University Press, 1986), 535.

⁴ Robert T. Foley, *German Strategy and the Path to Verdun: Erich von Falkenhayn and the Development of Attrition, 1870-1916* (Cambridge: Cambridge University Press, 2005), 256-257.

⁵ Hindenburg, 209.

...not without anxiety. Verdun had not fallen into our hands, and the hope of wearing down the French army in the mighty arc of fire which we had drawn round the northern and northeastern fronts of the fortress had not been realized. The prospects of a success for our offensive at that point had become more uninviting, but the enterprise had not yet been abandoned. On the Somme, the struggle had now been raging nearly two months. There we passed from one crisis to another. Our lines were permanently in a condition of the highest tension.⁶

With the German army still engaged in the failed offensive at Verdun and fighting in defense at the Somme, Hindenburg and Ludendorff had to quickly assess their situation in order to prevent defeat. The task that fell primarily to Ludendorff was to solve the difficult problems of an organization entrapped by its paradigm.

Ludendorff's actions, in the fall to winter time period of both 1916-1917 and then again in 1917-1918 resulted in astonishing successes for the German army. The army developed a doctrine and tactics for defense in depth known as elastic defense that it employed over the entire Western Front in 1917. In the elastic defense doctrine, the army was no longer tied to a piece of terrain in defensive operations. The goal for the defensive army was preservation of its combat power to allow for the possibility of a counterattack against an overextended attacker.⁷

As noted by Timothy Lupfer, the doctrine allowed soldiers on the front line, "...to shift to escape artillery fire, and survive in order to inflict casualties on the subsequent infantry assault. This shifting to escape Allied artillery could be to the flanks, to the rear, or to the front, and it usually occurred in the numerous shells holes."⁸ As an example of employment of this doctrine, Captain G. C. Wynne wrote:

[T]he defenders, no longer tied to a trench line, were entitled to fight a mobile action within the confines of a deep battlezone, to advance or retire as seemed

⁶ Hindenburg, 200-201.

⁷ Lupfer, 12.

⁸ Ibid., 15.

best at the moment, always provided that the whole battle and outpost zones were in their possession at the conclusion of the action. Although circumstances might compel detachments to retire, a general withdrawal on a wide front was not contemplated, but rather yielding of separate detachments giving up voluntarily untenable sectors of the position. These would rally on the support centres and counter-attack at any favourable opportunity...The defensive battle was to take the form of a number of local engagements of this kind, either flank and frontal counter-attacks over open ground, or bombing attacks along the front trench system by companies on the flanks of the break-in, or both combined. The attacker would in this way meet increasingly numerous and unforeseen obstacles and stronger resistance the deeper he penetrated the position.⁹

The elastic defense allowed the German army to survive the Entente's offensives in 1917 and almost brought the French army to the breaking point.¹⁰

By implementing the elastic defense, the German army gained enough strength throughout 1917 to allow it to go on a last chance offensive campaign in 1918. In the spring offensive of 1918, the army's development and use of infantry infiltration tactics coordinated with artillery and airpower almost led to a German victory.¹¹ The offensive essentially smashed the British Fifth army and almost led to a complete isolation and defeat of the entire British Expeditionary Force.¹² Ludendorff wrote that the battle, "...was a brilliant feat, and will ever be so regarded in history. What the English and French had not succeeded in doing we had accomplished, and that in the fourth year of the war...our troops had beaten the French and English and had proved themselves superior... Generally speaking, our tactics had proved sound."¹³ The measures taken by Ludendorff at the operational level of war enabled the German army organization to break through its mature paradigm.

⁹ G. C. Wynne, *If Germany Attacks: The Battle in Depth in the West* (London: Faber and Faber Ltd., 1940; reprint, Westport: Greenwood Press, 1976), 153-155.

¹⁰ Geyer, 539.

¹¹ *Ibid.*, 539.

¹² Johnson, 228.

¹³ Erich von Ludendorff, *Ludendorff's Own Story, August 1914-November 1918: The Great War from the Siege of Liege to the Signing of the Armistice as viewed from the Grand Headquarters of the German Army*, vol. 2 (New York: Harper & Brothers Publishers, 1919), 233.

Section II examines Ludendorff's actions for principles that provide insight into combating paradigmatic entrapment. The focus will be on organizational strategies that enabled the successful innovations and will not delve too deeply into the tactics themselves.

Section II. The Ludendorff Strategy

In order to successfully innovate during war, General Ludendorff had to essentially deal with each of the elements that make up the paradigmatic entrapment model. To be successful as the person responsible for changing the army's paradigm, he had to recognize that the organization was entrapped, guard against his own mental models while formulating a solution, and then adapt the organization for success against the disruptive architecture found on the battlefield. In adapting the organization, he had to break through the influence of the mature paradigm and cement his solutions in the culture of the army.

The first step for dealing with the phenomenon of paradigmatic entrapment is to recognize that it is occurring. While this may seem simple, the reinforcing nature of the organizational processes and the extreme organizational friction in time of war may make recognition very difficult. The tendency, as was the case with the French army, will often lead the organization to try to remain within the established paradigm, seeking an increase to the efficiency of operations. Insightful leadership has the key role in recognizing the cues from the respective situation for entrapment.

Upon being appointed First Quartermaster-General in August 1916, Ludendorff almost immediately saw that the army might be entrapped and that the current way the

German army fought was inadequate. At the onset of taking command, Ludendorff wrote, "...His Majesty the Emperor was induced to give the momentous order for the cessation of the offensive at Verdun. That offensive should have been broken off immediately it assumed the character of a battle of attrition."¹⁴ After working to end the offensive at Verdun, Ludendorff and Hindenburg set up a meeting with frontline commanders at Cambrai on September 7, 1916, which was barely a week into Hindenburg's command. Capturing his thoughts from the meeting at Cambrai, Ludendorff wrote:

...the question how [the loss of ground] and the progressive falling off of our fighting power of which it was symptomatic was to be prevented was of immense importance. It was just as necessary to have a clear idea of our fighting capacity as to know whether our tactical views were still sound. The first was an easy matter, the second of extreme difficulty. Opinions vary as much in strategical and tactical as in political and economic questions...The symptoms are recognized, but the underlying causes are the subject of controversy.¹⁵

Ludendorff knew that the fighting power of the German army was not as effective as it should be in the face of the enemy's firepower. He also realized that in order to solve the problem, he needed to uncover the underlying causes.

By the end of the conference at Cambrai, Ludendorff made the determination that the army was entrapped in its paradigm and would need reform, writing that his general impressions, "...were enough to show the necessity of altering the plan of fighting and of improving the army in tactics and in equipment. On the Eastern front we had for the most part adhered to the old tactical methods and the old training which we had learned in the days of peace. Here we met with new conditions, and it was my duty to adapt

¹⁴ Erich von Ludendorff, *Ludendorff's Own Story, August 1914-November 1918: The Great War from the Siege of Liege to the Signing of the Armistice as viewed from the Grand Headquarters of the German Army*, vol. 1 (New York: Harper & Brothers Publishers, 1919), 291.

¹⁵ *Ibid.*, 315-316.

myself to them.”¹⁶ Through both talking with frontline commanders and observing the results of the ongoing fighting at Verdun and the Somme, Ludendorff recognized the need for a radical departure from the current concept of operations.

After recognizing the need to innovate in the face of paradigmatic entrapment, leadership must find ways to apply the available technologies in innovative ways that counter the disruptive architectures found in the current situation. Due to the complexity of the environment, the solution most likely will not become intuitively obvious in a blinding flash of brilliance by an individual leader. Rather, as Clayton Christensen and Michael Raynor wrote, “Innovative ideas always emerge in a half-baked, partially formed condition.”¹⁷ In adapting to the environment, the organization has a capability to develop emergent strategy which may provide a solution to the current dilemma. Christensen and Raynor stated that emergent strategy:

...bubbles up from within the organization, [and] is the cumulative effect of day-to-day prioritization and investment decisions made by middle managers...These tend to be tactical, day-to-day operating decisions that are made by people who are not in a visionary, futuristic, or strategic state of mind...Emergent processes should dominate in circumstances in which the future is hard to read and in which it is not clear what the right strategy should be.¹⁸

The role of leadership becomes a role of recognizing successful emergent strategies and then applying them to the organization as a whole.

In the German army, another benefit of Ludendorff’s meeting at Cambrai was his exposure for the first time to a battalion that essentially was the result of an emergent process. Ludendorff wrote, “A company of the famous Von Rohr Storm Battalion formed the guard of honor for the Field-Marshal. For the first time I saw a single

¹⁶ Ibid., 324.

¹⁷ Clayton M. Christensen and Michael E. Raynor, *The Innovator’s Solution: Creating and Sustaining Successful Growth* (Boston: Harvard Business School Publishing Corporation, 2003), 214.

¹⁸ Ibid., 216.

detachment in full storming rig-out, with the steel helmets which had proved so extraordinarily, so wonderfully useful. We had not had them in the East.”¹⁹ Originally formed as a response to the trench warfare on the Western front, storm troops used innovative tactics that linked the artillery to infantry specialists who could punch holes in the enemy line that then allowed the regular infantry to follow and pour through the gap after it was created.²⁰ Upon conclusion of the conference, Ludendorff had already begun to formulate solutions for his perceived entrapment from his observations and talks with his field commanders as to the nature of the new unit.²¹ Ludendorff stated:

Lastly, the formation of storm troops from the infantry, which had begun during the war, had not only to be regularized, but to be adapted to the common good. The instruction formations and the storm battalions had proved their high value both intrinsically and for the improvement of the infantry generally. They were examples to be imitated by the other men. But for this it was necessary to have a training manual prepared, and this had yet to be done.²²

Although not actively encouraging an emergent strategy process, Ludendorff essentially recognized the fruits of the process as a starting point for a solution to his current problem.

If the development of infiltration tactics by the German army was a response to entrapment, it should have characteristics similar to paradigmatic solutions detailed previously from the other fields used as a basis for this model. From the scientific field, Kuhn wrote that scientists responsible for paradigmatic shifts usually were young or relatively new to the field having not been fully indoctrinated by the current paradigm.²³ As with Kuhn’s young scientists, in the development of infiltration tactics, Bruce

¹⁹ Ludendorff, vol. 1, 313-314.

²⁰ Bruce I. Gudmundsson, *Stormtroop Tactics: Innovation in the German Army, 1914-1918* (New York: Praeger Publishers, 1989), 46.

²¹ *Ibid.*, 84.

²² Ludendorff, vol. 1, 323.

²³ Kuhn, 90.

Gudmundsson noted that two young German officers were primarily responsible.

Lieutenant Colonel Max Bauer, a young artillery officer who was serving on the German General Staff, drove the process and Captain Willy Rohr was the chief developer.²⁴

From the corporate field, Christensen said that when managers of well-established firms were faced with developing a disruptive innovation into a profitable product, they often gave the development project to a smaller organization within the larger business. This protected the development of the innovation from the business' normal bureaucratic processes that tend to reject disruptive technologies. Christensen wrote, "[Successful managers] utilized some of the resources of the mainstream organization to address the disruption, but they were careful not to leverage its processes and values." Christensen recognized that managers influenced by a mature paradigm within an organization would most likely ignore or kill what would be perceived as a possible threat to current operations.²⁵ In keeping with Christensen's idea, Bauer's process for the development of the tactics was a protected assault detachment that was independent of the larger German army.²⁶

Initially, the development of what would become infiltration tactics almost suffered a death in the mature paradigm within the German army. Bauer was interested in testing a new, lightweight artillery that could support and be attached to attacking infantry. In March 1915, the War Ministry authorized Eighth Army Corps to form an Assault Detachment to experiment on the Western Front with this concept. Major Calsow was originally chosen to command the unit. Over the summer, the unit did some experimentation with the new artillery, but Calsow did not believe in the unit being the

²⁴ Gudmundsson, 45-47.

²⁵ Christensen, *The Innovator's Dilemma*, 112-114.

²⁶ Gudmundsson, 46.

laboratory that Bauer envisioned. Instead, Calsow used his unit to provide other units that were in need of his cannon and pioneers, essentially working within the established paradigm with poor results.²⁷ Gudmundsson wrote of the disastrous results of this unit:

The pioneers were used as line infantry while the assault cannon were used like the very weapons that they had been procured to combat...The cost of this improper employment was high. In the month of June the two pioneer companies had taken so many casualties from French artillery bombardments that they had to be consolidated into one understrength company...[As for the assault cannon], [e]ach time one fired, its pronounced muzzle flash made it easy for the French to determine its exact position. Once located, the assault cannon became the favorite targets of the French artillery.²⁸

Calsow was summarily relieved of command in August 1915 and replaced by Captain Rohr.²⁹

When Rohr took over the Assault Detachment, General Gaede, the commanding general of the unit to which it was attached, gave Rohr broad discretion to use the lessons from his front line service to train the unit however he saw fit. General Gaede also provided Rohr a machine gun platoon, a trench mortar platoon and a flamethrower platoon with which to experiment. Gaede's goal in providing the units was to give Rohr a micro-regiment with which to experiment.³⁰ However, Gudmundsson noted that Gaede's actions also created an additional effect:

...[T]he assignment of so many supporting arms to a battalion-sized unit prepared the way for a new concept of how an infantry battalion should be organized to fight. No longer the uniformly armed, deceptively symmetrical organization that had existed since the introduction of the bayonet at the end of the seventeenth century, the battalion was well on its way to becoming a team composed of different weapons...³¹

²⁷ Ibid., 46.

²⁸ Ibid., 46.

²⁹ Ibid., 47.

³⁰ Ibid., 47-48.

³¹ Ibid., 48.

Rohr took full advantage of his new assets and developed the basis for infiltration tactics used by stormtroops. Additionally, Rohr developed a training program and courses that could be taught to soldiers in the regular German army. Gudmundsson described Rohr's courses as, "...a radical departure from the tactics of 1914. Columns and skirmish lines were done away with. Squads were treated like tactical entities in their own right...In the movement across 'no man's land,' no attempt was to be made to have the squads maintain any sort of connection with each other."³² Fostered by the actions of the young officers Bauer and Rohr, and set up as a small, protected entity from the greater organization, the German army developed the counter to the World War I disruptive architecture on a small scale through what was essentially an emergent strategy process.

Although the infiltration tactics were tested and had proved successful on a small scale, Ludendorff had the huge challenge of adapting them quickly to the large scale operations of an entire army. While formulating his concept of operations for use of these tactics on a large scale, Ludendorff had to guard against his own mental models that might deter his ability to truly innovate by trapping him in his own paradigm. Senge noted that successful leadership from businesses that dealt with mental models utilized a team concept of senior leaders working with local management to make sense of complex situations. This provided a situation where multiple minds essentially worked the same problem, each providing a different viewpoint with the goal of finding, "...the best mental model for whoever happens to be out front on a particular issue."³³

Both Ludendorff's leadership style and the realities in the German army created a situation where Senge's strategy was put into action. Ludendorff favored a corporate

³² Ibid., 50.

³³ Senge, 188-191.

approach to leadership where he spent much time talking with his officer's in the field and his General staff, soliciting their ideas for operations.³⁴ Ludendorff wrote:

The enormous amount of work, together with the heavy responsibility which devolved upon me made it imperative for me to surround myself with independent, upright men, on whom I could call to express their opinions freely and frankly. They certainly did so--very emphatically, too, on occasions. Our co-operation was based upon mutual confidence...The final decision, of course, rested with me, for responsibility permitted of no hesitation.³⁵

In developing his ideas for the offensive operations of 1918, Ludendorff noted, "Once more I spent much time at the front, and in active interchange of ideas with the various army headquarters on the tactics of offensive fighting and the attack itself."³⁶ This corporate style of leadership informed his mental model of the situation giving him the benefit of numerous viewpoints.

In addition to his corporate leadership style, Ludendorff's General Staff provided the youthful insight necessary to combat a mature paradigm. In constituting his staff, Ludendorff wrote, "I accepted only officers who had fought in the front line...General Headquarters did have some complaints from the troops against [the staff], mainly on account of their youth, but on the whole they were highly respected...I had to take young men, to avoid withdrawal of too many officers capable of commanding."³⁷

These officers at General Headquarters were both independent and innovative thinkers due to the philosophy of training in the German army.³⁸ Gudmundsson wrote that instead of memorizing rote answers to questions, a tactical officer was "...placed in command of imaginary forces, presented with tactical dilemmas, and required to

³⁴ Lupfer, 8.

³⁵ Ludendorff, vol. 1, 17.

³⁶ Ludendorff, vol. 2, 211.

³⁷ Ludendorff, vol. 1, 467.

³⁸ Lupfer, 21.

formulate his own orders. Each solution was judged, not against a preselected 'school solution,' but rather according to the keenness of the student's observations and the soundness of his thought process."³⁹

Ludendorff not only populated his staff with these young officers, but he empowered them to operationalize his concept of operations. Ludendorff credited Colonel Bauer and Captain Geyer with the chief development of the elastic defense doctrine for the entire army, noting that they, "...deserve the greatest praise for this work."⁴⁰ Surrounding himself with younger officers provided the fresh perspective necessary to combat the paradigm within the organization.

Upon formulating the solution to the disruptive architecture of World War I, Ludendorff had to adapt the entire German army to the new ideas in order to prevent it from sabotaging his efforts, effectively breaking the old paradigm. Katz and Kahn noted that mature organizations that face major change were most effective when they took a sociotechnical approach. In this approach, a strategy for change must take into account, "...the social and technical aspects of organization and the needs and abilities of individuals."⁴¹ This approach to change involves adapting both the organizational structure and the ideas of members of the organization that create a new culture. Structurally, Christensen noted that in the face of disruptive technologies this can prove to be a challenge because "...organizational boundaries are often drawn to facilitate the operation of present processes. Those boundaries can impede the creation of new processes that cut across those boundaries."⁴² Christensen also agreed that members of

³⁹ Gudmundsson, 93.

⁴⁰ Ludendorff, vol. 1, 459.

⁴¹ Katz and Kahn, 716-717.

⁴² Christensen, *The Innovator's Dilemma*, 201.

the organization must be targeted because "...managers don't want to throw the existing processes out--the methods work perfectly well in doing what they were designed to do...Processes are meant to not change."⁴³ Ludendorff successfully applied this sociotechnical approach in the development of the elastic defense.

When Ludendorff took command of the German army, it was already beginning a structural reform in response to the weapons available at the time, and Ludendorff accelerated the process. Timothy Lupfer wrote that the German army:

...began the war with an infantry division that had two infantry brigades of two infantry regiments each. A reorganization...eliminated the brigade structure and created a division with three infantry regiments. The regiment consisted of three battalions...[The German Headquarters] also increased the artillery of the division. In contrast to the earlier German organization...in which the corps headquarters exercised the dominant control over artillery, the new German organization placed all artillery except the heaviest under the division commander.⁴⁴

This reorganization broke down some of the bureaucratic stovepipes in the army, leading to a closer cooperation of infantry and artillery units. Additionally, the German army changed the makeup of the battalions by giving the battalion commander direct control of machine guns and trench mortars.⁴⁵ Gudmundsson noted that this moved the regular infantry, "...farther along the trail already blazed by the assault battalions."⁴⁶

Ludendorff recognized that his new concept of operations must be taught to his frontline officers. Of the new defensive tactical doctrine, Ludendorff wrote, "Orders on paper were of themselves useless; they had to be ground into the flesh and blood of officers and men. We set up a course at Valenciennes for commanders of higher rank and for General Staff officers, to get rid of any ignorance as to the nature of defensive

⁴³ Ibid., 201.

⁴⁴ Lupfer, 16-19.

⁴⁵ Gudmundsson, 97.

⁴⁶ Ibid., 97.

fighting.”⁴⁷ At the school, officers had an opportunity to practice coordination of infantry and artillery and test new ideas as to their employment. Armies in the field also set up schools to train the new methods to junior officers and enlisted personnel. Lupfer noted that the training, “...emphasized integration of all combat arms, and officers received cross-training in various weapons when time and other demands allowed.”⁴⁸ The training and education along with the changes to structure created a new culture for the German army.

The final step that Ludendorff implemented in breaking through the paradigm was to continually adapt his basic ideas for elastic defense in response to the realities of the environment. Ludendorff stated that, “We knew, however, only too well that the enemy would soon adapt himself to our new tactics and that our advantage was only temporary.”⁴⁹ In order to combat the adaptive nature of the enemy, Ludendorff constantly fought for feedback from his army on the front line and allowed its experiences to evolve his innovative concept. After the initial attacks of 1917 of the French army against his elastic defense, Ludendorff wrote:

After each attack I discussed the tactical phenomena with General von Kuhl and Colonel von Loszberg, sometimes at the front, sometimes on the telephone. This time I again went to Flanders in order to talk over the same questions with officers who had taken part in the fighting. Our defensive tactics had to be developed further, somehow or other. We were all agreed on that. The only thing was, it was so infinitely difficult to hit on the right remedy.⁵⁰

Ludendorff’s willingness to continually adapt his concept is recognition that at the operational level of war, no single solution for breaking through a paradigm is perfect and each must constantly be adjusted due to the ability of the enemy to adapt.

⁴⁷ Ludendorff, vol. 1, 460.

⁴⁸ Lupfer, 24.

⁴⁹ Ludendorff, vol. 1, 363.

⁵⁰ Ludendorff, vol. 2, 102-103.

By first recognizing the symptoms of paradigmatic entrapment and then taking action to combat the phenomenon, Ludendorff was successful in his endeavor to revolutionize the German army. Although Germany ultimately lost the war, the reasons for its ultimate failure can be traced largely to strategic vice operational issues, such as the effect of a fresh United States entering the war and the war weariness of German citizens. Ludendorff's techniques and the German army's processes were fundamentally sound and can be used as a template for future organizations facing a similar problem. In the next and final chapter, this study concludes with a review of the key ideas presented in this model.

CHAPTER 5

CONCLUSION

Natural forces of inertia and resistance to change will continue to constrain military transformation.

--U.S. National Defense Strategy
March 2005, page 5

The QDR identifies many areas and technologies that promise to revolutionize the future force. However, transformation is as much a mindset and culture as it is a technology or a platform.

--General Peter Pace, CJCS
Chairman's Assessment, 2006 QDR
6 Feb 2006, A-5.

Military leadership, while developing its operational art to win the nation's battles, must ensure that it guards against the possibility of paradigmatic entrapment and develop strategies to cope with the phenomenon. As long as humanity remains the key element in the organizational construct, paradigmatic entrapment will be a danger to an organization's natural processes regardless of whether its purpose is to further science, garner a profit in the field of business, or wage and win wars. The leadership component in each particular field must maintain a constant vigilance as to how the paradigm within the organization influences reactions of members to the environment, guarding against, "[n]atural forces of inertia and resistance to change."¹

Developed from the fields of science and business, paradigmatic entrapment occurs when the paradigm within an organization no longer matches the realities in the current situation. If the current situation involves innovative technologies in a disruptive

¹ Department of Defense, *The National Defense Strategy of the United States of America* (Washington, D.C., March 2005), 5.

architecture, the military organization may suffer disastrous consequences. Military organizations develop a paradigm over often long periods of peace during which they must prepare to counter an unknowable foe in the future. As organizations grow over time, bureaucratic processes develop that sustain the current worldview and members in the organization are indoctrinated towards that paradigm.

As exemplified by the French army of World War I facing a disruptive architecture, paradigmatic entrapment results in an organization that constantly attempts to make the situation fit its own paradigm vice changing to meet the realities of the current environment. Without leadership recognizing a need for revolutionary change, the organization will continue to function fundamentally along the lines of how it was designed. The organization will attempt to refine what it does, becoming more efficient in its current paradigm, leading in the French case to massive casualties and an inability to conclude the war quickly.

In contrast, the German army under Ludendorff uncovered strategies that provide a starting point for effectively dealing with the phenomenon. Leadership is the key to dealing with a mature paradigm within an organization and must take the active lead to break through the entrapment. First, leadership must recognize that it is occurring. After recognition, leadership must find and implement concepts to counter the disruptive architecture present while guarding against their own tendency to foster a particular worldview. Often, as was the case in the German army, the process is one of recognition of an emergent organizational behavior that occurs on a small scale using an innovative process. Small, innovative groups may be the key to developing effective strategies in a large organization to prevent bureaucratic tendencies from killing innovative ideas, as the

Germans successfully did in developing infiltration tactics. To guard against his own mental models, Ludendorff essentially operated in a corporate mode whereby he informed his own opinions in discourse with others. By surrounding himself with younger members of his organization, he received an uncontaminated viewpoint that was different than his own.

After recognizing possible solutions, leadership must develop a strategy for implementation that fundamentally alters the existing organization and embeds the solution within the organizational culture. Without a comprehensive approach, organizations have a natural tendency to revert back to their current paradigm. Ludendorff achieved this by altering how he organized his divisions and altering the training and education of the army. The final step is recognizing that once implemented, a solution must continuously be adapted as it meets the reality of the situation.

Both the French and German army organizations were plagued by the phenomenon of paradigmatic entrapment, but only one took the comprehensive approach to revolutionary change. Although ultimately losing the war to arguably strategic factors, the German army under Ludendorff was able to break through its paradigm while the French army floundered. Ludendorff recognized that in order for true change to occur, the effort must be directed at both the minds of individuals and the culture in the organization, essentially targeting the human element in organizations. In order to successfully combat paradigmatic entrapment, modern leaders must develop strategies directed at the same. In so doing, victory can be achieved in an ever changing world.

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VITA

Major John K. Lussier was born on 10 December 1970, in Chattanooga, Tennessee. He graduated from Sullivan Central High School in 1989 and attended the United States Air Force Academy, where he graduated in 1993 as a distinguished graduate with a Bachelor of Science degree in Engineering Sciences. Upon graduation, Major Lussier received a scholarship to study in The George Washington University program at NASA—Langley Research Center known as the Joint Institute for the Advancement of the Flight Sciences. In 1994, he earned a Master of Science degree in Mechanical Engineering.

Major Lussier completed undergraduate pilot training at Ft. Rucker Army Installation, Alabama in 1996, and proceeded to his first operational flying assignment in the Sikorsky HH-60G PAVEHAWK at Nellis Air Force Base, Nevada. While there, he deployed in support of Operations SOUTHERN WATCH and NORTHERN WATCH in Kuwait and Turkey. Major Lussier was selected for the Air Force Intern Program in 1999, and he worked on the Joint Staff and Air Staff at the Pentagon while completing a Master of Arts in Organizational Management degree at The George Washington University.

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